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Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R10-92/036
December 1991

PB93-964603

PB93-964603

EPA

Superfund Record of Decision:

US DOE Idaho National Engineering Lab (Operable Unit 5), ID

NOTICE

The appendices listed in the index that are not found in this document have been removed at the request of the issuing agency. They contain material which supplement, but adds no further applicable information to the content of the document. All supplemental material is, however, contained in the administrative record for this site.

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R10-92/036	2.	3. Recipient's Accession No.

4. Title and Subtitle SUPERFUND RECORD OF DECISION US DOE Idaho National Engineering Lab (OU5), ID First Remedial Action - Interim	5. Report Date 12/05/91 6.
7. Author(s)	8. Performing Organization Rept. No.
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12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460	13. Type of Report & Period Covered 800/000 14.

15. Supplementary Notes

PB93-964603

16. Abstract (Limit: 200 words)

The Idaho National Engineering Laboratory (INEL), located 32 miles west of Idaho Falls, Idaho, occupies 890 square miles of the Eastern Snake River Plain. Land use at the INEL is industrial and mixed use, with a surrounding 500 square mile buffer zone used for cattle and sheep grazing. The 7,700 INEL employees use the Snake River Plain Aquifer that underlies the site, as a drinking water source. The aquifer has been proposed as a sole-source aquifer pursuant to the SWDA. The TRA contains high neutron flux nuclear test reactors. The Warm Waste Pond is located 200 feet east of the test reactor area. The Warm Waste Pond is composed of three wastewater infiltration/evaporation ponds. Over the past 40 years, the Warm Waste Pond received discharges of reactor cooling water, radioactive wastewater, and regenerative solutions from ion exchange columns. As a result of an investigation conducted in 1988, it was revealed that a release of radioactive and/or hazardous contaminants to the Warm Waste Pond had resulted in contamination of the pond sediments and subsurface water. The INEL is divided into 10 Waste Area Groups (WAGs), which are further subdivided into operable units to facilitate characterization and remedy selection for similar or unique contamination issues. This ROD addresses the interim remedy for the

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - US DOE Idaho National Engineering Lab (OU5), ID
First Remedial Action - Interim
Contaminated Media: sediment,
Key Contaminants: metals (chromium), radionuclides

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 40
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) See Instructions on Reverse

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

Abstract (Continued)

Warm Waste Pond sediments that are part of the WAG 2 group that includes the TRA. Other OUs are associated with this interim action and will address perched water below TRA. Contamination of the Snake River Plain Aquifer and complete evaluation of risks associated with the Warm Waste Pond will be addressed in separate investigations and remedial actions, as necessary. The contaminants in the perched water, currently being evaluated in an ongoing RI/FS, will be addressed in future remedial actions. The primary contaminants of concern affecting the sediments are metals, including hexavalent chromium; and radionuclides, including cesium-137 and cobalt-60.

The selected remedial action for this site includes physical separation, then chemical extraction, by treating onsite approximately 20,700 cubic yards of contaminated sediment; hydraulic or mechanical excavation to load sediments into screening plant; field screening to ensure all contaminated sediments are being excavated and input into treatment plant; conducting classification to further separate very fine-grained material from fine-grained material; chemical extraction of cesium-137, cobalt-60, and chromium using an acid solution; recovery of contaminants; testing residuals to determine radioactive and chemical constituents; treating to meet applicable storage and/or disposal criteria; and backfilling the pond to grade and revegetation. Pilot studies will be conducted to optimize the extraction process. Capital costs for the remedy, inclusive of treatment design, construction, treatability studies and storage of residuals, are estimated at $7,195,000. An additional O&M cost for temporary storage facilities and containers is estimated at $300,000 over the 18-month duration of the remedial process.

<u>PERFORMANCE STANDARDS OR GOALS</u>: Federal and state clean-up standards for cesium-37, cobalt-60, and chromium have not been established at this time. Clean-up objectives for cesium-37 are based on a 10^{-4} to 10^{-6} range for cancer risk to human health. Because this action does not constitute a final remedy for this operable unit, subsequent actions will fully address risks posed by the Warm Waste Pond sediments and associated contamination.

DECLARATION FOR THE WARM WASTE POND AT THE TEST REACTOR AREA AT THE IDAHO NATIONAL ENGINEERING LABORATORY

DECLARATION OF THE RECORD OF DECISION

Site Name and Location

Warm Waste Pond sediments
Test Reactor Area
Idaho National Engineering Laboratory

Statement of Basis and Purpose

This decision document presents the selected interim remedial action for the Warm Waste Pond sediments, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for the site.

The State of Idaho concurs with, and the Environmental Protection Agency approves, the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment, due to the radioactively-contaminated sediments of the Warm Waste Pond.

Description of the Selected Remedy

This Record of Decision addresses the contamination of the sediments of the Warm Waste Pond at the Test Reactor Area (TRA) at the Idaho National Engineering Laboratory (INEL). TRA is one of ten Waste Area Groups at the INEL which are under investigation pursuant to the Federal Facility Agreement/Consent Order (FFA/CO). The selected remedy is a combination of physical separation and chemical extraction to recover contaminants from the Warm Waste Pond sediments, followed by the backfilling of the Warm Waste Pond. The remedy addresses the significant potential risks associated with the site: external exposure to radiation, and inhalation and ingestion of contaminated sediment.

The major components of the remedy are:

- Treatability studies to optimize the extraction process,
- Excavation of the sediments which are contaminated above the specified criteria,
- Physical screening of the excavated sediment to remove the large grained-size particles,
- Classification to further separate the fine-grained particles,
- Chemical extraction of cesium-137, cobalt-60, and chromium using an acidic solution,
- Recovery of the contaminants from the acidic solution using ion exchange, precipitation, or distillation, if the residuals cannot be processed by the Idaho Chemical Processing Plant,
- Treatment of the waste residuals to be returned to the Warm Waste Pond, if needed, to meet the specified criteria,
- Backfilling the Pond to grade and vegetation, and
- Storage until final disposal of the product residuals.

Statutory Determination

This interim action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements for this limited-scope action, and is cost-effective. Although this interim action is not intended to address fully the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action does utilize treatment and is thus in furtherance of that statutory mandate, by utilizing permanent solutions and alternative treatment technology, to the maximum extent practicable given the limited scope of this action. Because this action may not constitute the final remedy for the Warm Waste Pond, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as the principal element, although partially addressed in this remedy, will be addressed at the time of the final response action. Subsequent actions may be necessary to address fully the principal threats posed by the site. Because this remedy will result in substances remaining on site, the effectiveness of the interim action as a final action will be evaluated in the comprehensive Waste Area Group Remedial Investigation/Feasibility Study and reviewed within five years of the initiation of the remedial action.

The comprehensive Remedial Investigation/ Feasibility Study for Waste Area Group 2 will succeed this interim action, which encompasses TRA in its entirety and will evaluate additional actions for TRA, including the Warm Waste Pond.

Signature sheet for the foregoing Warm Waste Pond at the Test Reactor Area at the Idaho National Engineering Laboratory Record of Decision between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

12/3/91
Date

AUGUSTINE A. PITROLO
Manager
Department of Energy Field Office, Idaho

Signature sheet for the foregoing Warm Waste Pond at the Test Reactor Area at the Idaho National Engineering Laboratory Record of Decision between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Dana A Rasmussen

12/5/91
Date

DANA RASMUSSEN
Regional Administrator, Region 10
Environmental Protection Agency

Signature sheet for the foregoing Warm Waste Pond at the Test Reactor Area at the Idaho National Engineering Laboratory Record of Decision between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Richard P. Donovan

RICHARD DONOVAN
Director
Idaho Department of Health and Welfare

12-4-91

Date

TABLE OF CONTENTS

ACRONYMS

AEA	Atomic Energy Act
ALARA	As low as reasonably achievable
ARARs	Applicable or relevant and appropriate requirements
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCA	Consent Order and Compliance Agreement
CWA	Clean Water Act
DOE	Department of Energy
EPA	Environmental Protection Agency
FFA/CO	Federal Facility Agreement/Consent Order
HWMA	Hazardous Waste Management Act
ICPP	Idaho Chemical Processing Plant
IDHW	Idaho Department of Health and Welfare
INEL	Idaho National Engineering Laboratory
LDR	Land Disposal Restrictions
nCi/gm	nanocuries per gram
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPL	National Priorities List
OSHA	Occupational Health and Safety Administration
OU	Operable Unit
pCi/gm	picocuries per gram (1/1000th of nCi/gm)
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
TBCs	to-be-considered
TCLP	toxicity characteristic leaching procedure
TRA	Test Reactor Area
WAG	Waste Area Group

DECISION SUMMARY

I. SITE DESCRIPTION

The Idaho National Engineering Laboratory (INEL) is located 32 miles west of Idaho Falls, Idaho and occupies 890 square miles of the northeastern portion of the Eastern Snake River Plain. The Test Reactor Area (TRA) is located in the southwestern portion of the INEL (see map this page). The Warm Waste Pond is located approximately 200 feet east of TRA and consists of three wastewater infiltration/evaporation cells comprising approximately 4 acres (see map next page).

The area around TRA is relatively flat. Elevations range from 4,907 to 4,945 feet above sea level from the bottom of a pond to the top of a rubble pile. Generally, the land surface slopes slightly from southwest to northeast. Elevation in the Warm Waste Pond ranges from 4,908 to 4,913 feet.

Current land use at the INEL is classified as industrial and mixed use by the Bureau of Land Management and has been designated as a National Environmental Research Park. The developed area within the INEL is surrounded by a 500 square mile buffer zone used for cattle and sheep grazing.

Approximately 7,700 people are employed at the INEL, with approximately 580 employed at TRA. The nearest off-site populations are in the cities of: Atomic City (13 miles southeast of TRA), Arco (17 miles west), Howe (14 miles north), Mud Lake (32 miles northeast), and Terreton (34 miles northeast).

The INEL property is located on the northern edge of the Eastern Snake River Plain, which contains a substantial volume of silicic and basaltic volcanic rocks with relatively minor amounts of sediment. Underlying TRA are a series of basaltic lava flows interbedded with sediments. The basalts immediately beneath the site are relatively flat and covered by 40 to 50 feet of alluvium. The Snake River Plain Aquifer underlies the INEL and has been proposed as a sole source aquifer pursuant to the Safe Drinking Water Act.

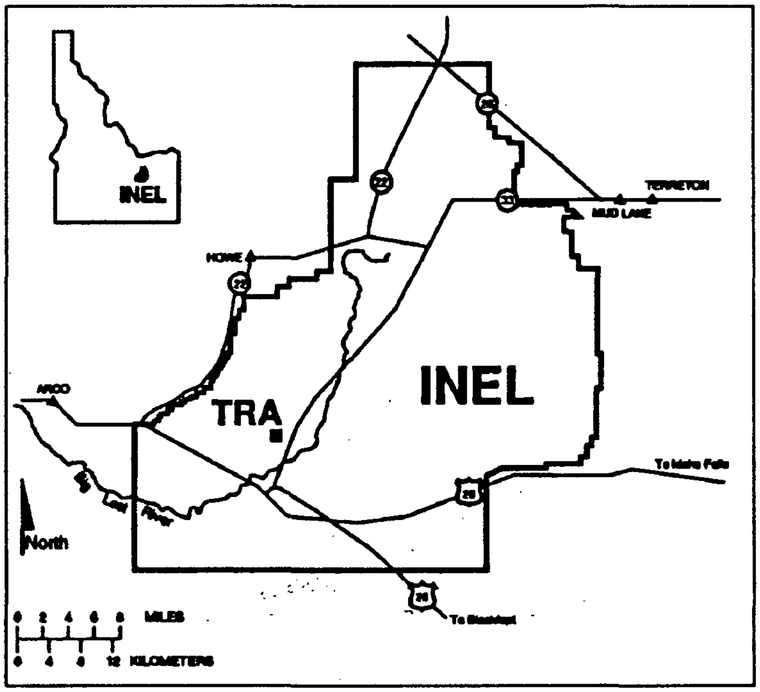

Figure 1: Test Reactor Area (TRA) at the Idaho National Engineering Laboratory (INEL)

The INEL has semidesert characteristics with hot summers and cold winters. Normal annual precipitation is 9.1 inches per year, with estimated evapotranspiration of 6 to 9 inches per year. Twenty distinctive vegetative cover types have been identified at the INEL, with big sagebrush the dominant species, covering approximately 80 percent. The variety of habitats on the INEL supports numerous species of reptiles, birds, and mammals.

TRA covers approximately a 1,700 by 1,900 foot area and is surrounded by a double security fence. Located inside of the fence are more than 73 buildings and 56 structures, such as tanks, cooling towers, and roads. Located outside of the fences are parking areas, a helicopter landing pad, a sewage treatment plant, a stack, a storage area, and four waste disposal ponds. Also located around TRA are unpaved roads, groundwater monitoring wells, and rubble piles.

The Warm Waste Pond consists of three cells; one excavated in 1952 with bottom dimensions 150 by 250 feet and a depth of 15 feet, one excavated in 1957 with bottom dimensions of 125 by 230 feet and a depth of 15 feet, and one excavated in 1964 with bottom dimensions of 250 by 400 feet and a depth of 6 feet.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

TRA is located in the southwestern portion of the INEL north of the Big Lost River (Figure 1). The facility houses high neutron flux nuclear test reactors. The TRA Warm Waste Pond is located approximately 200 feet east of TRA, outside the security fence (Figure 2). In the past, the Warm Waste Pond has received discharges of reactor cooling water, radioactive wastewater, and regenerative solutions from ion exchange columns.

The release of radioactive and/or hazardous contaminants to the Warm Waste Pond was identified and evaluated during investigations conducted in accordance with the Resource Conservation and Recovery Act (RCRA) Corrective Action requirements of the July 1987 DOE-ID/EPA Consent Order/ Compliance Agreement (COCA).

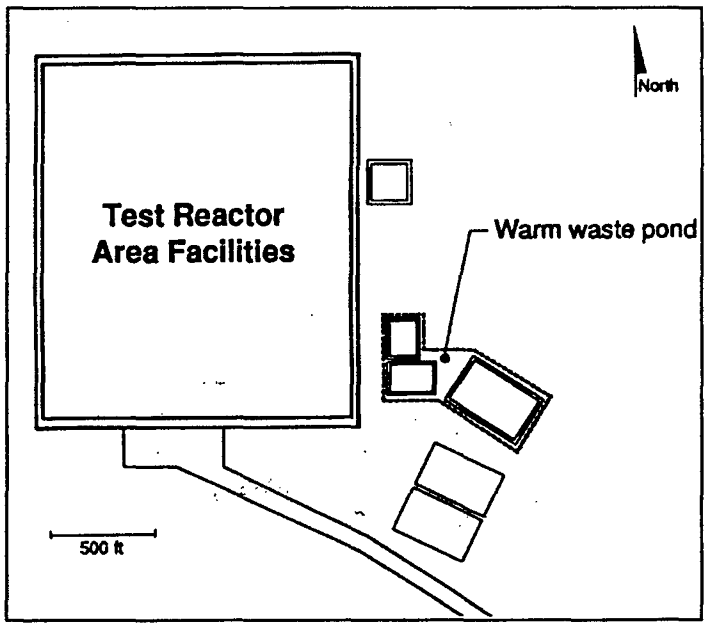

Figure 2: Warm Waste Pond at Test Reactor Area

The INEL was proposed for listing on the National Priorities List (NPL) on July 14, 1989 [54 FR 29820]. The listing was proposed by the EPA under the authorities granted EPA by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The final rule which listed the INEL on the NPL was published on November 21, 1989 in 54 FR 44184.

One of the reasons for the NPL listing was the release to groundwater of contaminants from facilities at the TRA. These contaminants, mainly chromium and radionuclides, were released to the environment at the Warm Waste Pond and other locations at TRA. Use of chromium as a cooling tower corrosion inhibitor was discontinued in 1972.

Based on the characterization data available in the Administrative Record for the sediments of the Warm Waste Pond, a significant potential risk to human health and the environment has been identified. The Warm Waste Pond was proposed for an interim action under the Federal Facility Agreement/Consent Order (FFA/CO). This Record of Decision documents the decision to perform that interim action and the remedy selected. The Warm Waste Pond interim action will be evaluated for adequacy as a final remedial action in the Waste Area Group 2 (WAG 2) Comprehensive Remedial Investigation/Feasibility Study (RI/FS) scheduled to begin in 1996. WAG 2 encompasses TRA and the immediately surrounding area.

The Warm Waste Pond sediments have been sampled several times. In 1983, one sample was collected for RCRA Appendix VIII analysis. In 1987, six sediment samples were collected for RCRA Appendix VIII analysis. In 1988, eighty eight samples were collected to depths over 10 feet below the top of the sediments for the Preliminary Investigation conducted under the COCA. In 1990, twenty six samples were collected from the upper two feet of sediment following CERCLA protocol. Evaluation of the data from these sampling efforts and the preliminary risk evaluation performed based on those data served as the basis for this interim action. The contaminants which were mainly found in highest concentrations in the upper two feet of the sediments are shown in the following table.

Contaminant	Average Concentration	Half-life
Radionuclides		
Cesium-137	11,500 pCi/gm (11.5 nCi/gm)	30.2 years
Cobalt-60	4620 pCi/gm (4.62 nCi/gm)	5.3 years
Non-Radionuclides		
Chromium	338 mg/kg	-
Zinc	143 mg/kg	-
Sulfide	28 mg/kg	-

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

A series of five public informational meetings were held in late June 1991 in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow to explain how the CERCLA process works and to introduce the Warm Waste Pond cleanup project to the public. These informational meetings were announced via the INEL Reporter newsletter distributed to 11,700 INEL employees as well as 2100 of the general public, newspaper and radio advertisements, and an INEL press release. Personal phone calls were made to key individuals, environmental groups, and organizations by the INEL field offices in Pocatello, Twin Falls, and Boise. The Community Relations Plan Coordinator made calls to Idaho Falls and Moscow. Each of the meetings were videotaped.

The Notice of Availability for the Proposed Plan was published July 28, 1991 in the Post Register (Idaho Falls), Idaho State Journal (Pocatello), Times News (Twin Falls), Idaho Statesman (Boise), and Idahoan (Moscow). A similar newspaper advertisement appeared in the same newspapers the following week repeating the public meeting locations and times. Personal phone calls, as noted above, were made to inform key individuals and groups about the comment opportunity.

The Proposed Plan for the interim action of the TRA Warm Waste Pond sediments was mailed to the public on July 26, 1991. The Proposed Plan was mailed to 2,100 individuals on the INEL mailing list with a cover letter from the Director of the Environmental Restoration Division of the DOE Field Office, Idaho urging citizens to comment on the Plan and to attend public meetings. Copies of the Plan and the administrative record are available to the public in six regional INEL information repositories: INEL Technical Library in Idaho Falls; and city libraries in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow. Copies of the administrative record file for the Warm Waste Pond Sediments Interim Action were placed in the information repositories sections or at the reference desk in each of the libraries on July 26, 1991.

The public comment period was held from July 29, 1991 to August 28, 1991. No extension requests were made. Public meetings were held on August 7, 8, 13, 14, and 15, 1991 in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow respectively. At the meetings in Idaho Falls and Pocatello, representatives from DOE, EPA and IDHW discussed the project, answered questions, and received public comments. At the meetings in Twin Falls, Boise, and Moscow, DOE and IDHW were represented. Verbatim transcripts were prepared by a court reporter of each public meeting. Each was recorded on audio tape and the Twin Falls and Boise meetings were videotaped as well. Written comment forms were distributed at each of the meetings.

A Responsiveness Summary has been prepared as part of the Record of Decision. All verbal comments, as given at the public meetings, and all written comments, as submitted, are repeated verbatim in the Administrative Record for the Record of Decision. Those comments are annotated to indicate which response in the Responsiveness Summary addresses each comment.

In general, there were two predominant public opinions on the preferred alternative as described in the Proposed Plan; the opinion that it was too expensive, or agreement that it was the best of the alternatives presented. Other issues raised were: adequacy of characterization data; operations at TRA, e.g., the continued use of the Pond; adequacy of the risk assessment process; remedial alternatives, including use of the Idaho Chemical Processing Plant (ICPP) for treatment of residuals from the interim action; ability to implement the proposed action and disposition of the residuals created; research of remedial technologies; degree of oversight of DOE and its contractors in performing the remedial action; community relations; and NEPA.

IV. SCOPE AND ROLE OF OPERABLE UNIT AND RESPONSE ACTION

Under the Federal Facility Agreement/Consent Order (FFA/CO) the INEL is divided into ten Waste Area Groups (WAGs). The WAGs are further subdivided into operable units. TRA has been designated WAG 2, and the Warm Waste Pond sediments have been designated Operable Unit 2-10 (OU 2-10), one of the thirteen operable units at TRA. As is commonly done on many Superfund sites, similar or unique problems at a site are grouped into operable units to make characterization and remediation activities more efficient. In this case, existing characterization data were available to identify the Warm Waste Pond sediments as a significant threat to human health and the environment and select a remedial technology. Therefore, the Warm Waste Pond sediments were designated as an operable unit to expedite an interim action.

Two of the thirteen operable units at TRA are related to this interim action: OU 2-12 and OU 2-13. OU 2-12 consists of the contaminated perched water below TRA. Some of the contaminants of concern in the perched water resulted from disposal of wastewater to the Warm Waste pond. The perched water is currently being evaluated in an ongoing RI/FS. OU 2-13 is the final, overall evaluation of all characterization and remediation activities in WAG 2, which encompasses all of TRA and the immediately surrounding area. All actions conducted at TRA will be considered in the OU 2-13 RI/FS, from the perspective of TRA as a whole to ensure that all issues have been addressed adequately. Conducting this interim action is part of the overall site strategy and is expected to be consistent with any planned future actions.
The interim action is, therefore, intended to reduce the risks associated with the Warm Waste Pond sediments. Contaminants in the perched water and their effect on the Snake River Plain Aquifer in the vicinity of TRA will be evaluated in the OU 2-12 RI/FS, and remedial action undertaken, as necessary. A complete evaluation of all risks associated with the Warm Waste Pond will be conducted as part of the final comprehensive OU 2-13 RI/FS.

V. SUMMARY OF SITE CHARACTERISTICS

The Warm Waste Pond consists of three wastewater infiltration cells, which have been used for the disposal of reactor cooling water, radioactive wastewater, and regenerative solutions from ion exchange. From 1952 until 1962, all liquid wastes from TRA, except sanitary sewage, were discharged to the Warm Waste Pond. Wastewater from the demineralization plant went to the Pond until 1962. Other non-radioactive wastewater, including water from the cooling towers, was disposed of in the Pond until 1964. Since 1964, the Warm Waste Pond has received only radioactive wastewater. The volume of wastewater discharged to the Warm Waste Pond has ranged from over 200 million gallons per year from 1958-1963 and 1969-1976 to less than 20 million gallons per year from 1987 to the present. Contaminant levels in the wastewater discharged to the Pond have decreased significantly in the past 12 years. However, these past disposal practices have resulted in contamination of the pond sediments.

The Warm Waste Pond was sampled several times between 1983 and 1990. Due to the types of wastewater discharged to the Pond, the contaminants are mainly of two types: inorganics and radionuclides. The inorganics, primarily metals, mainly resulted from the non-radioactive wastewater sources. The contaminant in the highest concentration, and therefore the largest total mass, is chromium which was used (in hexavalent form) until 1972 as a corrosion inhibitor in the cooling towers. The hexavalent chromium in the Pond sediments has undergone chemical reduction to trivalent chromium, which is less toxic and less mobile than hexavalent chromium. The total estimated volume of trivalent chromium in the Pond sediments is over 26,000 pounds with an average concentration of 338 parts per million (ppm). In addition to chromium, some of the other metals (with their corresponding average concentration in the upper two feet of sediment and total weight in the Pond) are: zinc, 143 ppm, 4,085 pounds; lead, 18 ppm, 819 pounds; arsenic, 5 ppm, 631 pounds, and mercury, 3 ppm, 139 pounds. The Pond sediments are not RCRA characteristic or listed hazardous waste.

Radionuclides have been discharged to the Warm Waste Pond for nearly 40 years. Cumulatively, over 5 billion gallons of wastewater was discharged into the Pond. Peak volumes of over 200 million gallons annually were discharged between 1958-1963 and 1969-1976. In recent years, the radionuclide content of the wastewater has dropped significantly. From 1979 to 1987, the total activity of the wastewater going to the Pond was reduced by over 90 percent. Therefore, the radioactive contaminants which are now of greatest concern are those of greatest quantity disposed or radionuclides that have not naturally decayed to levels resulting in acceptably reduced risk. In addition, those radionuclides which were not trapped by the sediments, for example tritium, will be addressed in a separate operable unit. Based upon the combination of total quantity discharged, half-life, and ability of the Pond sediments to capture the radionuclide, the predominant radionuclides at the present time are (with total curies disposed, radioactive decay half-life, and average current concentration): cesium-137, 157 curies, 30.2 years, 11.5 nCi/gm; cobalt-60, 471 curies, 5.3 years, 4.6 nCi/gm; and strontium-90, 99 curies, 29.1 years, 0.5 nCi/gm. Nineteen radionuclides have been identified in the Pond sediments and most are present in very small amounts. The cesium-137 and cobalt-60 are associated with the fine-grained sediments in the upper two feet of the Pond.

VI. SUMMARY OF SITE RISKS

Introduction

A preliminary risk evaluation was prepared to determine the risks to human health and the environment posed by the Warm Waste Pond sediments. A future use scenario was evaluated in addition to the present case to ensure the consideration of the long-term adequacy of the remedial alternatives. The preliminary evaluation consisted of two parts, human health and ecological, and was utilized to determine if unacceptable risks are present. The final Record of Decision (i.e., the comprehensive WAG 2 RI/FS) which addresses this operable unit will evaluate the effectiveness of this interim action based upon a quantitative risk assessment.

Preliminary Human Health Risk Evaluation

Potential present and future risk(s) posed by the Warm Waste Pond sediments were assessed in a preliminary risk evaluation using the standard procedures and default parameters established in EPA guidance documents to determine if the risk justified a remedial action. In addition, a future use scenario was evaluated so that remedial alternatives could also be considered in terms of potential future risk(s).

Present Risk(s)

Since the Warm Waste Pond is currently under the institutional control of INEL site security and is surrounded by a fence which approximates the boundary of the contaminated area, the potential exposure scenarios, based on the present condition of the pond, were occupational scenarios. The hypothetical receptor was assumed to be located at the boundary of the operable unit as defined by the institutional controls (the fence). Two exposure pathways were analyzed: inhalation of airborne, contaminated dust, and external exposure to radiation. Several exposure conditions, ranging from 40 percent of the day, every day for 40 years to 5 hours per week for one year, were evaluated. A toxicity assessment was conducted to determine the health effects associated with the identified contaminants. Noncarcinogenic and carcinogenic toxicity values were identified or derived to perform the risk evaluation. Risks were quantified for the selected contaminants of concern (individually), for multiple substances, and for multiple pathways (for radionuclides). Noncarcinogenic effects were evaluated based on the hazard quotient/index of toxicity. Carcinogenic risks were evaluated and compared to the accepted NCP target risk range of 10^{-4} to 10^{-6} excess incidence of cancer.

The preliminary evaluation of noncarcinogenic effects showed that all hazard quotients were less than one for individual chemicals. The hazard index which sums the potential effects was also less than one, indicating that no adverse health effects (noncarcinogenic effects) are expected from the contaminants for the pathways evaluated. Carcinogenic risks for the inhalation pathway were found to be in the range of 3×10^{-10} to 6×10^{-7} for chemical and 3×10^{-8} to 7×10^{-5} for radionuclides. The NCP target risk range was not found to be exceeded for the inhalation of chemical or radionuclides. Carcinogenic risks for the external exposure pathway for radionuclides were found to be in the range of 7×10^{-4} to 3×10^{-1}, and therefore exceeded the NCP target risk range. For both pathways, cesium-137 and cobalt-60 are the primary risk drivers due to their higher concentrations. Therefore, the risk due to external exposure represents an unacceptable risk which must be reduced in this interim action.

Future Risk(s)

In addition to the present occupational scenarios described above, ingestion of contaminated soil was evaluated as a potential future risk. One potential scenario selected for evaluation consisted of a residential receptor (a farming family with children) which is assumed to reside at the operable unit starting in 100 years (2091), which is assumed for calculation purposes to be the end of institutional controls. One hundred years is the DOE/NRC standard for closure of low-level radioactive waste facilities, and for the preliminary evaluation was assumed to be a reasonable time to expect institutional controls to be maintained. The concentrations of contaminants used in the evaluation were based on sampling data which was then corrected for radioactive decay to establish contaminant concentrations after 100 years. The exposure assessment followed EPA guidelines for default exposure parameters.

All hazard quotients for the evaluated chemicals were less than one, which indicate that no adverse health effects (noncarcinogenic effects) are expected from the ingestion of soil for the residential receptor. The noncarcinogenic hazard index (combined chemicals) is also below the level of concern for noncarcinogenic effects. The carcinogenic risks for the chemicals was 3×10^{-5} and radionuclides was 4×10^{-5}, which are within the NCP target risk range. However, when combined with the inhalation pathway the risks do exceed the NCP target range. In each case, cesium-137 is the primary risk driver.

Summary

The external exposure scenario based on an occupational receptor with the present condition of the Warm Waste Pond is above the NCP target risk range and an interim action is warranted. As mentioned, the Warm Waste Pond is currently under institutional controls, and DOE procedures are to reduce personal radiation exposure to as low as reasonably achievable (ALARA). The inhalation scenario, based on the occupational receptor under the present conditions, and the ingestion scenario, based on a future residential scenario of the Warm Waste Pond beginning in 100 years, are both within the calculated target range. However, cumulatively, the inhalation and ingestion scenarios are above the NCP target risk range and should be reduced. This interim action will reduce the current risk posed by the radiation field of the Warm Waste Pond and reduce potential future concerns.

The calculated risk values carry some uncertainties inherent in the risk evaluation process. The calculated risk values represent estimates of potential effects and do not represent characterization of absolute risks. The risk measurements are conditional estimates dependent on a number of assumptions about exposure and toxicity. However, the preliminary risk evaluation is believed to be a reasonably protective estimate of risk and supports the need for an interim action.

Ecological Concerns

Ecological concerns will be addressed in the Remedial Investigation/Feasibility Study for the WAG-wide Record of Decision. Since the major exposure routes are expected to be the same as human exposures, the risk reduction realized due to this interim action should achieve a significant reduction in adverse ecological effects.

VII. DESCRIPTION OF ALTERNATIVES

Potential technologies which would achieve significant risk reduction while the final remedy is developed were identified from the available literature. The technologies evaluated for this interim action were temporary capping, stabilization, and a combination of physical separation and chemical extraction. In addition, the no action alternative was evaluated.

Alternative 1: No Action

The no action alternative was evaluated in accordance with EPA guidance. Under the no action alternative, the current institutional controls which restrict access to the Warm Waste Pond would be maintained. As is shown in the comparative analysis of alternatives, the no action alternative was found to be unacceptable because it does not provide overall protection of human health and the environment.

Alternative 2: Temporary Capping

Capping involves backfilling the Pond and covering the site with a barrier to prevent biological (plant and animal) and precipitation intrusion. Cap design and construction would consider: the need to attenuate the gamma radiation associated with the Pond sediments; minimization of long-term water infiltration through the contaminated material; maintenance minimization; and drainage and erosion. A typical cap design for the Warm Waste Pond would include:

- Backfilling the Pond to above grade with locally available materials (if within design standards),
- A three-foot layer of clay to prevent precipitation infiltration,
- A one-half foot layer of sand to provide drainage,
- A two-foot thick layer of cobbles acting as an anti-biointrusion layer, and
- A three-foot thick layer of soil to allow vegetation.

Estimates of capital costs, including design and construction, for capping are $2,786,000. Operational and maintenance costs would be approximately $50,000 annually which includes monitoring and maintenance of institutional controls. A cap would take approximately nine months to construct following five months of design and review.

Temporary capping has the advantages of ease of application, the fact that it is a well known technology, and high reliability if maintained properly. Capping has relatively low capital costs. Soil characteristics are not as critical for capping as other technologies and soil is an excellent gamma radiation shield. The greatest disadvantage of capping is that it does nothing to eliminate the contaminants, it simply impedes releases by shielding. All contaminants remain in the Pond area. Plant roots, excavations for various purposes, such as utilities repair, and unwitting penetrations (e.g., post holes) could result in significant breaches in the cap. Building construction is a clear threat to a cap. In addition, long-term maintenance costs for a cap can be significantly higher than for a permanent remedy over time. However, as capping is a temporary measure, significant additional costs may be realized at final remedy selection.

Alternative 3: Stabilization

Solidification is a process which creates a monolithic block of immobilized waste with high structural integrity in which the contaminants are mechanically, but not chemically, bonded with the solidification agents and matrix. By adding chemical reagents, and thereby chemically binding the contaminants, solidification becomes stabilization which further limits solubility and mobility of the contaminants. Common reagents applicable to the Warm Waste Pond sediments and proven to be effective in many cases include portland cement, pozzolanic fly ash, bitumen, and lime. Stabilization is done one of two ways: the reagent is injected and mixed with the sediments in place or the sediment is dug up and machine mixed with the stabilization agent which is then re-deposited on or off site. A pilot-scale study would be required prior to remedial design to optimize the reagent concentration, mixing rate, and other process variables. The estimated capital cost of stabilization, including the pilot-scale study, design, and construction, is $5,296,000. Stabilization would take approximately one year to implement following seven months of design and review, some of which could be concurrent with the pilot-scale study. The stabilized soil and contaminants would remain in the Pond and actually increase the volume of contaminated sediment.

The advantages of stabilization are that the release and mobility of the contaminants are reduced or eliminated. Stabilization can also facilitate transportation and off-site disposal, especially where volume reduction or extraction techniques have been applied previously. Stabilization may be effective in binding chemical contaminants in addition to the radionuclides. Among the disadvantages of stabilization is the fact that its long-term effectiveness is unknown. Also, stabilization traps the contaminants, but does not remove or eliminate them. All contaminants remain in the Pond and capping may be necessary to minimize exposure. Some chemicals, particularly organics, may interfere with the stabilization process.

Alternative 4: Separation/Extraction

The separation/extraction alternative consists of a combination of two technologies: physical separation and chemical extraction.

Physical Separation

Based on sampling of the Pond sediments, the radioactive and chemical contaminants in soils are commonly associated with the fine-grained soil particles. Separation of the fine-grained soil particles concentrates the contaminants and therefore reduces the volume of soil for further treatment or disposal. Physical separation utilizes mechanical methods for separating heterogeneous mixtures of solids to obtain a concentrated form of the contaminants. Chemical agents may be added to enhance the separation process. The different types of physical separation are typically most effective in dealing with a specific size range of soil particles and a combination can be used to isolate the size fraction desired. There are four major categories of separation technology applicable to soil remediation: screening, classification, flotation, and gravity concentration. Screening is the separation of particles on the basis of size by passing the particles through a uniformly perforated surface. Classification is the separation of particles according to their settling rate in water. Flotation is concentration of the contaminants in the froth which collects on a liquid. Gravity separation is separation of particles based on density, shape, weight, and size.

Based on the results of the bench-scale treatability study of the Warm Waste Pond sediments, the particles which are larger than 1/16th of an inch consist of more than 60 percent of the volume. Therefore, screening would be the first part of any treatment system for the Pond sediments. Further isolation of finer grained materials would likely be done with classification or gravity separation. The large and relatively uncontaminated particles would be returned to the Pond.

The advantages of physical separation are: it is an inexpensive method for separating coarse and fine materials, high continuous processing capabilities are possible, and they are well proven in the mining industry. The disadvantages are: screens are subject to plugging, soils with large amounts of fine-grained materials are difficult to process, and to achieve a high level of separation of a particular size particle requires longer processing times.

Chemical Extraction

Chemical extraction uses chemicals to extract the cesium, cobalt, and chromium from the sediment. The most common chemicals used for extraction are water, inorganic salts, mineral acids, and complexing agents. Other chemical extraction methods include precipitation, solvent extraction, and ion exchange. There are notable differences in the extractability rates of each of the methods caused by the types of soil.

Bench-scale testing indicates that using acids as the extracting agents is effective in extracting cesium, cobalt, and chromium from the Warm Waste Pond sediments. Chromium removal will be maximized even though it was not shown to pose a risk in the preliminary risk evaluation. The advantages of extraction with acids are: a high percentage of radionuclides can be removed, a relatively small liquid-to-solids ratio is required, requiring less pumping power and smaller tanks and equipment, and the acids can likely be recycled. The disadvantages of using acids for the extracting agents are the possibility of increased costs due to the use of relatively expensive reagents, higher operating temperatures, and stainless steel vessels and pipes. It is possible that undesirable byproducts, such as characteristic mixed (radioactive and hazardous) waste, could be produced which would be subject to RCRA regulatory requirements.

Separation/Extraction

For the contaminated sediments of the Warm Waste Pond, predominantly in the upper two feet, a combination of physical separation followed by chemical extraction is proposed. The interim action will be preceded by a pilot scale treatability study focusing on the chemical extraction portion of the remedy. The purpose of the pilot treatability study will be to determine if the extraction efficiencies which have been demonstrated in the bench scale treatability study can be achieved on a larger scale. Specifically, the pilot study will evaluate whether an average of 90 percent removal of cesium, cobalt, and chromium can be achieved with no

RCRA-hazardous wastes generated which cannot be treated to be non-characteristic. The estimated capital cost of the separation/extraction remedy, including the pilot study, design, construction, and storage of the product residuals is $7,195,000. The separation/extraction unit would be operated for approximately one year, followed by backfilling and grading. Design will be completed following treatability study work, which will take nearly ten months to complete following issuance of the Record of Decision.

Separation/extraction reduces the risks by removing much of the cesium-137 and cobalt-60 from the Pond sediments. These radionuclides would be concentrated as the product of the treatment process and would be further treated and stored on site such that it could be visually monitored, either directly or indirectly, until its final disposal can be determined in the comprehensive WAG RI/FS. Following the separation/extraction process and return of the residuals to the Pond, the Pond would be backfilled. Backfilling will provide additional reduction of potential external exposure from remaining contamination. The remaining risk of the Pond sediments will be evaluated in the comprehensive WAG RI/FS. The selected remedy is described in Section IX.

VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

CERCLA guidance requires that each remedial alternative be evaluated according to specific criteria. The purpose of the evaluation is to determine the advantages and disadvantages of each alternative, and thereby guide selection of the remedial alternative offering the most effective and feasible means of achieving the stated cleanup objectives. While all nine CERCLA criteria are important, they are weighted differently in the decision making process depending on whether they describe a required level of performance (threshold criteria), technical advantages and disadvantages (balancing criteria), or review and evaluation by other entities (modifying criteria). The four remedial alternatives described in Section VII were evaluated according to the following CERCLA criteria:

- Threshold criteria
    - Overall protection of human health and the environment
    - Compliance with ARARs
- Balancing criteria
    - Long-term effectiveness and permanence
    - Reduction of toxicity, mobility, or volume through treatment
    - Short-term effectiveness
    - Implementability
    - Cost
- Modifying criteria
    - State acceptance
    - Community acceptance.

Threshold Criteria

The remedial alternatives were evaluated in relation to the threshold criteria: overall protection of human health and the environment and compliance with ARARs. The threshold criteria must be met by the remedial alternatives for further consideration as potential remedies for the Record of Decision. The threshold criteria must be met for a final remedial action, and this interim action is intended to meet those criteria, if possible. The effectiveness of this remedial action will be evaluated as a final remedy in the WAG-wide RI/FS.

Overall Protection of Human Health and the Environment

Overall protection of human health and the environment requires evaluation of how well the remedial alternatives eliminate, reduce, and control the identified risks. This overall assessment of protection of human health and the environment draws on the assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. For an interim action, the present risk(s) to human health and the environment must be reduced. If this interim action is successful, potential risks will be reduced to acceptable levels, and further remedial action may be unnecessary. The interim action will be followed by a final remedial action either in the WAG-wide RI/FS, or the perched water RI/FS, if necessary.

All of the remedial alternatives which were considered, except the no action alternative, provide short-term protection of human health and the environment by reducing the radiation field and therefore the potential risk due to external exposure. All of the alternatives except the no action are therefore acceptable as interim actions.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

CERCLA, as amended by SARA, requires that remedial actions for Superfund sites comply with Federal and State laws that are applicable to the action being taken. Remedial actions must also comply with the requirements of laws and regulations that are not directly applicable, but are relevant and appropriate; in other words, requirements that pertain to situations sufficiently similar to those encountered at a Superfund site such that their use is well suited to the site. Combined, these are referred to as applicable or relevant and appropriate requirements (ARARs). State ARARs are limited to those requirements which are more stringent than Federal requirements. Compliance with ARARs requires evaluation of the remedial alternatives for compliance with chemical-, location-, and action-specific ARARs or justification for a waiver; and whether the remedial alternative considers other criteria, advisories, and guidelines.

A waiver for interim measures may be applicable when a remedial action is only part of a total set of measures as is the case for the Warm Waste Pond sediments. This waiver may be granted if complete measures that will attain all ARARs will follow the interim action within a reasonable period of time. In this case, all ARARs will be addressed by the WAG-wide Record of Decision, if not already attained in the interim action. An interim measure should not complicate nor delay the overall site cleanup and should be consistent with it. The granting of ARARs waivers should not present an immediate threat to public health and the environment.

Chemical-Specific ARARs. Chemical- (and radionuclide-) specific ARARs are standards for allowable levels of certain contaminants in the environment and are generally issued pursuant to the Federal Safe Drinking Water Act (SDWA), the Clean Water Act (CWA), the Clean Air Act (CAA), the Resource Conservation and Recovery Act (RCRA; chemical, but not radionuclides), the Atomic Energy Act (AEA; radionuclides, but not chemicals), and state and local counterpart requirements.

When a chemical- or radionuclide-specific ARAR exists and is considered to be protective of human health and environment, it becomes a specific cleanup goal. For the Warm Waste Pond sediments, chemical-specific ARARs for cleanup standards are available for water and air only. No specific cleanup levels for chemicals in soils are available. Guidance provided under the authority of the AEA includes numerical criteria for air and water for radionuclides. DOE has not established radionuclide-specific criteria for soil, but has established performance-based standards for soil contamination at operating and decommissioned facilities. If a chemical- or radionuclide-specific ARAR does not exist or is not adequately protective, the health-based risk assessment performed under the RI would determine the appropriate cleanup goal .

The SDWA is generally used as the ARAR for appropriate cleanup standards for contaminated groundwater that is or may be used as drinking water. The CWA provides guidelines to determine water quality standards of surface receiving waters. Since this interim action addresses the external exposure concerns for the Warm Waste Pond sediments and does not address groundwater or surface water, the SDWA and CWA are not ARARs, for this limited action.

RCRA provides chemical-specific ARARs in the areas of groundwater monitoring, cleanup standards, and treatment standards. The standards apply if the waste is a listed or characteristic waste under RCRA, and either (1) the waste was treated, stored, or disposed after the effective date of RCRA requirements under consideration, or (2) the CERCLA activity constitutes treatment, storage, or disposal as defined by RCRA. The Hazardous Waste Management Act (HWMA) establishes the State of Idaho's authorization to implement the RCRA program.

In the case of the Warm Waste Pond, the sediments are not RCRA hazardous wastes based on tests conducted in 1990. In addition, no RCRA wastes were disposed in the Pond after 1972, prior to the promulgation of RCRA. Therefore, RCRA is not applicable for establishing cleanup or treatment standards for this action. If the remedy creates RCRA-hazardous waste, that waste will be subject to the requirements of RCRA and Land Disposal Restrictions (LDRs) requirements may be triggered.

Requirements under the AEA are applicable to the procurement, use, and disposal of all source, byproduct, and special nuclear material at the INEL. Regulations governing operations of the DOE facility are contained in 10 CFR 200 et seq, and are implemented through DOE Orders, Directives, and Notices that specify policy, standards, and guidance for all DOE facilities. Although DOE Orders are not ARARs since they are not promulgated requirements, all of the requirements of DOE Orders are to be considered (TBCs). DOE Orders which may apply to CERCLA activities include DOE 5480.11 and DOE 5820.2A. DOE 5480.11, "Radiation Protection for Occupational Workers," establishes radionuclide-specific criteria to protect workers from hazard of exposure to ionizing radiation and radioactive materials. DOE 5820.2A, "Radioactive Waste Management," establishes standards for "external exposure to the waste and concentration of radioactive material which may be released into surface water, groundwater, soil, plants, and animals results in an effective dose equivalent that does not exceed 25 mrem/year to any member of the public... and assures that the committed effective dose equivalents received by individuals who inadvertently may intrude into the facility after the loss of active institutional control (100 years) will not exceed 100 mrem/year for a continuous exposure or 500 mrem/year for a single acute exposure." Capping, stabilization, and separation/extraction as described all meet this standard.

The CAA establishes national standards and goals for air pollution control. For less common air pollutants that can have acute effects on public health, such as radionuclides, EPA establishes National Emission Standards for Hazardous Air Pollutants (NESHAP). Specific NESHAP regulations apply to allowable off-site radionuclide doses to the public from emissions at DOE facilities. Due to its location within the INEL, over fifteen miles from the nearest city, the small scale of the processing plant, and the engineering controls used to limit air emissions, the activities at the Warm Waste Pond should not result in additional off-site exposure to the public.

Action-Specific ARARs. Certain design, performance, or action-specific ARARs could affect this interim action.

If the requirements of RCRA LDRs apply to the residual waste, treatment technologies meeting those restrictions will have to be employed or treatability variances sought.

Engineering controls will be used to the extent possible to eliminate or minimize air emissions and will be described in the remedial design. The substantive requirements of the Idaho Rules and Regulations for the Control of Air Pollution will have to be met if the extraction procedure would result in the release of gases, vapors and/or fugitive emissions.

Location-Specific ARARs. Location-specific requirements include ordinances or rules and regulations as well as restrictions or guidance contained in major Federal and State environmental programs.

Idaho Water Quality Standards are issued on a basin-by-basin basis and are therefore location-specific, but are only applicable to a remedial action if it involves a point-source discharge to surface or ground waters, and therefore is not applicable to any of the alternatives.

Although the National Historic Preservation Act would be applicable to CERCLA actions, there are no places of historic significance which will be affected by remediation activities at the Warm Waste Pond. Since no threatened or endangered species or habitat have been identified at the Warm Waste Pond, the Endangered Species Act is not an ARAR.

Balancing Criteria

Once an alternative satisfies the threshold criteria, five balancing criteria are used to evaluate other aspects of the potential remedial alternatives. Each alternative is evaluated using each of the balancing criteria. The balancing criteria are used in refining the selection of the candidate alternatives for the site. The five balancing criteria are: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. Each criterion is further explained in the following sections.

Long-Term Effectiveness and Permanence

In evaluating long-term effectiveness and permanence, the magnitude of residual risks as well as the adequacy and reliability of controls must be examined.

The magnitude of remaining risks is evaluated by assessing the residual risk associated with untreated waste and the treated residual. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate.

Adequacy and reliability of controls is evaluated by assessing the containment and/or institutional controls to determine if they are sufficient to ensure that any exposure to residual risks to human health and the environment is within protective levels. It includes consideration of the potential need to replace technical components of the remedial action, such as a cap, and the potential exposure pathway and risks which could be posed should the technical components degrade over time.

For capping, the remaining risks are associated with the buried contaminants, all of which remain in the Pond sediments. Capping reduces the potential risk due to external exposure, inhalation, and ingestion to the extent that the integrity of the cap and backfilled material can be assured until such time that the radioactive contaminants of concern have decayed to an acceptable level. It is estimated to be 400 years until the cesium-137 in the Warm Waste Pond will decay to an acceptable level. Caps have a design life of 100 years and require maintenance throughout the use of the cap. Therefore, capping cannot be considered as permanent as separation/extraction.

Stabilization meets the criterion for long-term effectiveness by binding up the contaminants in the cement/sediment matrix, thereby reducing residual risks. Unfortunately, the permanence of stabilization technology is unproven for the length of time needed for the cesium-137 to decay to acceptable levels and like capping is not as permanent as separation/extraction.

Separation/extraction reduces the potential risks associated with the cesium, cobalt, and chromium in the Warm Waste Pond sediments by removing the contaminants of concern by placing the treated residuals in a controlled environment, thereby permanently reducing the risks associated with the Warm Waste Pond. The treated material could present a risk due to its radioactive content, but will be treated, containerized, and stored in such a way as to be monitored, either directly or indirectly. Institutional controls will be maintained until its final disposal.

Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently reduce toxicity, mobility, or volume of the hazardous substances as their principal element. Evaluation of alternatives based on the reduction of toxicity, mobility, or volume through treatment requires analysis of the following factors: the treatment process used; the toxicity and nature of the material treated; the amount of hazardous material destroyed or treated; the irreversibility of the treatment; the type and quantity of treatment byproducts; and the statutory preference for treatment as a principal element.

Capping does not involve any treatment and therefore does not satisfy the statutory preference for remedial actions involving treatment. While not reducing the toxicity or volume of the contaminants within the sediment matrix itself and thereby eliminating exposure, capping can isolate the contaminants of concern from the environment.

Stabilization reduces the toxicity and mobility of the contaminants of concern by binding them in the cement/sediment matrix. However, stabilization increases the volume of contaminated material due to the addition of the binding agents. Stabilization could interfere with future remedial actions, if determined to be necessary.

Separation/extraction offers the greatest reduction of toxicity, mobility, or volume of the cesium, cobalt, and chromium in the Warm Waste Pond sediments of the alternatives evaluated. The toxicity and mobility of cesium, cobalt, and chromium are reduced by removing an adequate amount of contaminants. The volume of contaminated material is significantly reduced in the separation/extraction process. The separation process removes the large-grained materials which make up over 60 percent of the volume of contaminated materials. The contaminants of concern are then leached from the fine-grained materials. That concentrated residual would contain most of the cesium-137 and cobalt-60 from the Pond sediments. The process will be further evaluated in the pilot-scale treatability study.

Short-Term Effectiveness

The evaluation of alternatives based on short-term effectiveness requires an evaluation of the effectiveness of protection for the community and workers during remedial actions, environmental impacts during implementation, and the amount of time required for remedial action objectives to be achieved.

During implementation of any of the alternatives, protection of workers from radiation exposure would be an important element of the remedial design. Since the Warm Waste Pond is a radiologically controlled area, all personnel entering the area must have training for hazardous substances, radioactive substances, and respirators. Health physics personnel will be on site at all times when work is ongoing to monitor and control personnel radiation exposure. Every person entering the working area at the Pond will wear appropriate personal protective equipment, including a dosimeter to record the radiation received. DOE has ALARA (as low as reasonably achievable) radiation dose goals for personnel which will be met.

By using engineering controls, such as a protective enclosure, and access restrictions, the remedial action will not be a risk to the community. Access to visitors and others not working on the project will be strictly limited to those meeting the same training requirements as the workers.

The remedial actions would begin in 1992. Stabilization and separation/extraction would require a pilot-scale treatability study to refine design parameters during the remedial design phase, which would be completed in the spring and summer of 1992. Upon completion of the pilot-scale treatability study, final remedial design could be completed, with the remedial action initiated. Capping could be implemented without testing.

Implementability

The implementability criterion has three factors requiring evaluation: technical feasibility; administrative feasibility; and the availability of services and materials. Technical feasibility requires an evaluation of the ability to construct and operate the technology, the reliability of the technology, the ease of undertaking additional remedial action (if necessary), and monitoring considerations. The ability to coordinate actions with other agencies is the only factor for evaluating administrative feasibility and is not a concern for this project. The availability of services and materials requires evaluation of the following factors: availability of treatment, storage capacity and disposal services; availability of necessary equipment and specialists; and availability of prospective technologies.

The technical feasibility of capping is well established. Cap design and construction is a readily available technology which has been in common use for a number of years. Capping is reliable to the extent that the integrity of the cap can be maintained. In this case, only a temporary cap would be installed as this is not the final remedial action. The cap is expected to provide interim protection until the final remedial action was implemented. A cap is easily removed, although additional material will become contaminated increasing the amount of material which must be dealt with in any future remedial actions.

Stabilization is a rapidly emerging technology for treating contaminated soils. Several companies have developed equipment for mixing the stabilization agents with the soil in place, and the equipment and personnel are available. Stabilization would require a pilot-scale treatability study to determine the best stabilization agents, mixing rate, mixing speed, etc... Two concerns with stabilization are the reliability of the technology and the ease of undertaking additional remedial actions should it be necessary in the future. The technology is unproven for the length of time required for the cesium-137 to decay to acceptable levels, therefore additional remedial action may be required at a future time. The solid, stabilized mass could make it very difficult to pursue additional remedial actions. The stabilized material would also require backfilling to reduce the potential radiation exposure.

Physical separation and chemical extraction are well developed technologies which have been used in the mining industry for extraction of radionuclides from ores. Physical separation is an easily implemented technology, in this case simply requiring separation of the sediment into different grain size fractions using screens or sieves. Chemical extraction has not been used to remediate a cesium-contaminated site, but bench-scale testing for this interim action on the Warm Waste Pond sediments indicates that nearly 90 percent of the contaminants of concern can be removed from the fined-grained material in the Warm Waste Pond after it has been separated from the coarse material, which comprise over 60 percent of the total volume. A pilot scale treatability study would be required to determine the best operating parameters, such as reagent strength, holding times, and flow-through rates. The pilot treatability study would also be used to ensure that no RCRA-hazardous wastes are generated. An additional treatment process within the plant may be required for this purpose. All of the components of the pilot-plant and the final remedial treatment plant are available. The separation/extraction process generates a concentrated residual containing a large percentage of the contaminants of concern. In this case, that residual is expected to be low-level radioactive waste. Although storage and/or disposal facilities are available at the INEL, the State, as a condition of concurrence, requires that any low-level waste residuals will be stored and visually monitored, either directly or indirectly, until final disposition.

Cost

In evaluating project costs, an estimation of capital costs, operation and maintenance costs, and present worth costs are required. Capital costs include design, construction, equipment, buildings, startup, and contingency costs. Operating and maintenance costs include labor, power, disposal of residuals, administration, and periodic review. Actual costs are expected to be no more than 50 percent over, or 30 percent under, the cost estimate.

Capital costs for capping are estimated at: design - $250,000; construction - $2,113,000; 20 percent contingency - $423,000; total - $2,786,000. Maintenance and operation are estimated to be an additional $50,000 annually.

Capital costs for stabilization are estimated at: design - $400,000; construction - $3,480,000, 20 percent contingency - $696,000; pilot-scale treatability study - $720,000; total - $5,296,000. No operating and maintenance costs have been identified for the stabilization option.

Capital costs for separation/extraction are estimated at: design - $500,000; construction -$4,704,000; 20 percent contingency - $941,000; treatability studies - $750,000; storage of product residuals - $300,000; total $7,195,000. The only operating and maintenance costs identified for the separation/extraction alternative is that associated with the storage of the treatment process wastes not returned to the Pond. Those costs are estimated to be $300,000 for a temporary storage facility and storage containers.

All of the alternatives would be implemented and completed within the same time frame, with a maximum difference of duration of 18 months. Therefore, all costs are in 1991 dollars.

Modifying Criteria

The modifying criteria are used in the final evaluation of remedial alternatives. The two modifying criteria are state acceptance and community acceptance. For both of these criteria, the factors which are considered include the elements of the alternatives which are supported, the elements of the alternatives which are not supported, and the elements of the alternatives which have strong opposition.

State Acceptance

This assessment evaluates the technical and administrative issues and concerns the state may have regarding each of the alternatives.

The State of Idaho prefers the separation/extraction alternative because it takes the contaminants of concern from an uncontrolled situation to a controlled situation. If separation/extraction is implemented, the State prefers that the storage of the residuals be conducted such that they can be visually monitored, either directly or indirectly, until their final disposition is determined.

Community Acceptance

This assessment evaluates the issues and concerns the public may have with each of the alternatives.

Capping was preferred by some citizens due to its lower cost and the possibility of improved technologies which may be developed in the near future. Other citizens categorically reject capping because it is not a cleanup and wanted the contaminants removed from the sediments.

Stabilization received the least amount of public comment of the alternatives, although some citizens did not consider it to be a cleanup.

Separation/extraction was preferred by those citizens who felt that only by removing the contaminants from the sediments could a cleanup be realized, although those same citizens expressed concern that no final disposition for the residuals has been determined. Other citizens felt that separation/extraction was too expensive.

IX. THE SELECTED REMEDY

The selected remedy consists of physical separation followed by chemical extraction and includes the following steps: excavation, screening, classification, chemical extraction, recovery, residuals treatment, storage and/or disposal. The successful implementation of the selected remedy depends upon the success of the pilot-scale treatability study, a demonstration project. If the goals of the pilot-scale project are not met, the Warm Waste Pond sediments will be addressed in an amendment to this Record of Decision or in a subsequent final action. The pilot-scale demonstration will be a smaller-scale version of the proposed facilities which will be used to fine-tune the design of the classification, chemical extraction, and recovery systems.

First, the sediments must be excavated to be input to the pilot plant. Two excavation techniques are being considered: hydraulic and heavy machinery. Hydraulic excavation consists of the use of a water-jetting and suction system. The sediments are excavated using a water stream which is sucked into the input side of the screening system. The advantages of hydraulic excavation are the lack of dust produced and the fact that the large-grained materials can be left in the Pond if the system is adjusted properly. Hydraulic excavation will be considered in the pilot-scale demonstration project. Heavy machinery excavation is the use of bulldozers, backhoes, front-end loaders and other similar equipment to remove the sediments and load them into the input side of the screening plant. Either excavation technique, or a combination of the two, will be used.

An average of two feet of sediment will be excavated from the Pond. Field screening with portable gamma detecting instruments and/or sampling will be conducted during the excavation to ensure that all of the contaminated sediments above the removal criteria are being excavated and input to the treatment plant. The removal criteria is based upon risk reduction to within the NCP target range. Based upon the preliminary risk evaluation, it is estimated that a level of cesium averaging below 690 pCi/gm in the Pond sediments will adequately reduce the potential risks. Therefore, that has been established as the removal criteria. The total volume of excavated material will be approximately 20,700 yd^3 based on a surface area (including banks) of 280,000 ft^2 and an average depth of 2 feet. The estimated weight of the material, assuming all grain sizes are excavated, that will be input to the screening plant is 44,000 tons with an assumed feed rate of 5 tons per hour.

Screening is the first portion of the treatment plant. The screen plant will separate the large-grained material from the fine-grained material. Based upon the bench-scale treatability study, at least a 60-percent volume reduction in contaminated material is expected following screening. Water is likely to be used during screening to wash the large-grained materials, as well as keep dust to a minimum. The larger material will be returned to the Pond. It is estimated that wet screening will separate 29,000 tons of large-grained material to be returned to the Pond.

It is likely that classification will follow screening to further separate very fine-grained material from fine-grained material. Hydrocylones or similar equipment will be used to further reduce the volume of material input to the chemical extraction unit. The larger material will be returned to the Pond. An additional 20-percent reduction in volume of contaminated material is expected following classification, resulting in 12,000 tons of very fine-grained material to be input to the chemical extraction system, assumed to be fed at the rate of 1.5 tons per hour.

The very fine-grained material resulting from the physical separation processes is input to the chemical extraction unit. The fine-grained material is mixed with acid and held in a tank to allow maximum leaching of the contaminants. The strength and type of acid as well as the holding time will be evaluated in the treatability studies, but hydrochloric acid or aqua regia (a mixture of nitric acid and hydrochloric acid) appear to work most effectively. The extraction system is expected to be a two stage system. The chemical extraction process results in two products: the waste residuals which are removed from the liquid and an acidic liquid which contains the contaminants of concern. The waste residuals will be combined with backfill materials and returned to the Pond. The mixture of residuals and backfill materials will meet the removal criteria. The Pond will be backfilled to above grade following completion of processing of the sediments.

The acidic liquid is input to the recovery system which removes the contaminants of concern. The preferred recovery system is ion exchange, although chemical precipitation or filtration may prove more cost effective. Ion exchange produces less sludge than chemical precipitation or filtration, but has not proven as efficient in bench-scale tests. The liquid can then be recycled and reused in the chemical extraction system. It is likely that the cesium, cobalt, and chromium can be removed individually from the acidic liquid. It may be possible to treat the cesium and cobalt liquid waste stream at the Idaho Chemical Processing Plant (ICPP) at the INEL. The residual would be processed in the residual treatment portion of the treatment plant.

The residuals will be tested to determine the radioactive and chemical constituents and treated, if necessary, to meet all applicable storage and/or disposal criteria. For example, if the residuals are RCRA-hazardous due to leaching using the TCLP test, they will be treated to reduce the leachability to ensure that all storage and disposal criteria are met. If the residuals contain any liquids they will have to be dried. If separate residuals are created by separating the cesium, cobalt, and chromium individually, each will be tested and treated as necessary.

The residuals will then be stored in containers such that they can be visually monitored, either directly or indirectly, to verify the integrity of the storage containers until the final disposition of the residuals is determined. The disposition of the residuals will be determined no later than the WAG-wide Record of Decision scheduled to begin in 1996. The storage criteria will be finalized following the pilot-scale treatability study from which the characteristics of the waste will be determined. The waste is expected to be low-level radioactive, non-RCRA hazardous waste, and if so, the residuals will be stored within a radioactive storage area. The expected criteria for selection of storage containers and controls is the radioactive field due to the residuals and the associated restrictions and requirements. The storage containers likely to be used are concrete boxes, which provide radiological protection and can be stored such that the integrity of the containers can be monitored. One of the goals of the pilot study is to minimize the amount of waste created.

Pilot-Scale Treatability Study

As the proposed remedial alternative is an innovative technology and has not been used for the remediation of radiologically-contaminated soils, testing of the processes involved will be required. Bench-scale testing has indicated that the required removal efficiency of the contaminants of concern can be achieved using a combination of separation and extraction. Additional bench-scale testing will be conducted to optimize the extraction efficiency. The pilot study is to demonstrate that the processes which have been proven in the laboratory can be replicated in a scaled-up processing plant.

The goals of the pilot study are:

- Verify the 60+ percent reduction in volume by screening,
- Evaluate whether an average of 90 percent removal of cesium, cobalt, and chromium can be achieved,
- Maximize the efficiency of the classification process to minimize the amount of materials input to the chemical extraction unit,
- Determine the parameters in the chemical extraction unit which will achieve the required removal efficiency while at the same time produce the smallest amount of residuals,
- Minimize the waste produced by the recovery system,
- Minimize or eliminate any characteristic which makes the waste RCRA hazardous, including treatment if necessary, and
- Provide design information for the remedial action, particularly in the area of geometry of components to minimize potential exposure to workers.

The primary goal of the pilot plant is to demonstrate the removal efficiency of cesium-137, cobalt-60, and chromium. Although cobalt-60 presents a potential risk due to the radiation field associated with it, its relatively short half-life of 5.3 years effectively eliminates it in the future use scenarios beginning in 100 years. A design goal for the cesium-137 removal was established based upon reduction of potential risks to within the NCP target range. Backfilling of the Pond following the separation/extraction reduces the risk due to external exposure and will reduce or eliminate the present potential risk due to inhalation. Based upon these assumptions, a preliminary estimate of the cleanup level for cesium-137 of 1385 pCi/gm would achieve a calculated risk of one in 10,000 increased incidence of cancer. Therefore, the pilot study will maximize the cesium-137 removal efficiency. The removal/backfill criteria established at an average concentration of 690 pCi/gm would put the estimated calculated risk in the range of one in 100,000. Higher removal efficiency will be utilized if possible and the adequacy of the interim action as a final action will be assessed in the comprehensive WAG RI/FS.

X. STATUTORY DETERMINATION

CERCLA remedy selection is based on the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the regulations contained in the National Contingency Plan (NCP). SARA requires that the EPA utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. All remedies must meet the threshold criteria established in the NCP: protection of human health and the environment and attainment of ARARs.

Protection of Human Health and the Environment

As described in Section IX, the selected remedy will eliminate or reduce identified risks at the Warm Waste Pond by treating the Pond sediments to the extent necessary. The remedy will reduce the cumulative carcinogenic risk due primarily to external exposure to within the 10^{-4} to 10^{-6} range as required by the NCP. Storage and/or disposal of the concentrated residuals will meet all applicable acceptance standards.

Compliance with ARARs

The selected remedy will comply with the substantive requirements of all ARARs. ARARs are discussed in Section VIII.

Cost Effectiveness

Although the estimated cost for the selected remedy is higher than that for the other alternatives, separation/extraction provides a long-term solution that compensates for the additional costs by removing the majority of the contaminants of concern and thereby providing potentially permanent protection of human health and the environment. It also removes these contaminants from the Pond making them unavailable for potential leaching into the underlying soils and groundwater.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Possible

The selected remedy meets the statutory requirements to utilize permanent solutions and treatment technologies to the maximum extent possible, for this interim action. The Agencies prefer a potential permanent solution whenever possible and in the case of the Warm Waste Pond, it is possible to meet the objectives of an interim action and provide a potentially permanent treatment solution. The selected remedy significantly reduces the volume of contaminated material. In addition, it will reduce the volume of contaminants in the Pond sediments. Based on the evaluation of the CERCLA remedial alternative criteria, and in particular the five balancing criteria, separation/extraction is the clear choice if seeking a long-term solution which reduces the toxicity, mobility or volume of the contaminants. The criteria which was the determining factor was long-term effectiveness. Utilizing separation/extraction will increase the likelihood that no future remedial actions will be required for the Warm Waste Pond.

Preference for Treatment as a Principal Element

The statutory preference for treatment that permanently and significantly reduces the toxicity, mobility, or volume of hazardous substances as a principal element is met by the use of separation/extraction, which provides a permanent reduction in toxicity, mobility, and volume of the contaminated material at the Warm Waste Pond.

XI. EXPLANATION OF SIGNIFICANT DIFFERENCES

A significant change from the Proposed Plan set forth in the Record of Decision is the elimination of the contingency remedy. In the Proposed Plan, it was stated that if the pilot study of the physical separation/chemical extraction was unsuccessful, a contingency remedy, capping, would be implemented. Upon reevaluation, it was determined that since the primary purpose of a cap is to prevent infiltration of precipitation and that the need for such infiltration prevention has not been determined, the need for a cap has not been established. If the need to prevent infiltration of precipitation is identified in the perched water RI/FS or the comprehensive WAG RI/FS, a cap would be evaluated as an option at that point. As part of the interim action, the Pond would be backfilled to above grade, which would reduce the radiation field and mitigate the potential for blowing dust. In the event the goals of the pilot-scale project are not met, a soil cover will be placed over the Warm Waste Pond to reduce the radiation field and mitigate the potential for blowing dust.

Another change from the Proposed Plan is the possibility of shipping the cesium and cobalt residual for treatment at the ICPP which is located at the INEL.. This option had not been considered in the Proposed Plan, but was suggested by a commentor at a public meeting. The treatability studies will determine if the use of ICPP for treatment is possible and cost effective.

RESPONSIVENESS SUMMARY

Overview

The sediments of the Warm Waste Pond at the Test Reactor Area (TRA) are the first operable unit to be addressed through a Record of Decision at the Idaho National Engineering Laboratory (INEL). A Proposed Plan was released on July 25, 1991 with a public comment period from July 29 to August 28, 1991. The Proposed Plan recommended a combination of physical separation and chemical extraction to remove cesium-137 and cobalt-60 from the Pond sediments.

Nearly all of the comments were verbal comments received at the public meetings held at five locations around the State of Idaho. Only fifteen sets of written comments were received from 10 individuals.

In general, there were two predominant public opinions on the preferred alternative as described in the Proposed Plan; it was too expensive or it was the best alternative of the alternatives presented. Those who felt the preferred alternative was too expensive usually expressed concern that a large sum of money was being spent to reduce potential risks which did not reflect the actual risks posed by the Pond. Many felt capping, the least expensive alternative, should be the implemented action. The other predominant reasoning was that of the alternatives evaluated in the Proposed Plan, only the preferred alternative was actually a "cleanup," given that each of the other alternatives leaves the contaminants in the ground.

Other issues raised were: adequacy of characterization data; operations at TRA, the continued use of the Pond; adequacy of the risk assessment process; remedial alternatives; ability to implement the proposed action and disposition of the residual created; research of remedial of technologies; degree of oversight of DOE and its contractors in performing the remedial action; community relations; and NEPA.

Background on Community Involvement

A series of five public informational meetings were held in late June 1991 to explain how the CERCLA process works and to introduce the Warm Waste Pond cleanup project to the public. These informational meetings were announced via the INEL Reporter newsletter, newspaper and radio advertisements, and an INEL press release. Phone calls were made to key individuals, environmental groups, and organizations by the INEL field offices in Pocatello, Twin Falls, and Boise. The Community Relations Plan Coordinator made calls to key individuals in Idaho Falls and Moscow. Each of the meetings were videotaped.

The Notice of Availability for the Proposed Plan was published July 28, 1991 in the Post Register (Idaho Falls), Idaho State Journal (Pocatello), Times News (Twin Falls), Idaho Statesman (Boise), and Idahoan (Moscow). A similar newspaper advertisement appeared in the same newspapers the following week repeating the public meeting locations and times. Personal phone calls as noted above were made to inform key individuals and groups about the comment opportunity.

The Proposed Plan for the interim action of the TRA Warm Waste Pond sediments was mailed to the public on July 26, 1991. The Proposed Plan was mailed to 2,100 individuals on the INEL mailing list with a cover letter from the Director of the Environmental Restoration Division of the DOE Field Office, Idaho urging citizens to comment on the Plan and to attend public meetings. Copies of the Plan and the administrative record are available to the public in six regional INEL information repositories: INEL Technical Library in Idaho Falls; and city libraries in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow. The Administrative Record file for the Warm Waste Pond Sediments Interim Action was placed in the information repositories sections or at the reference desk in each of the libraries on July 26, 1991.

The public comment period was held from July 29, 1991 to August 28, 1991. No extension requests were made. Public meetings were held on August 7, 8, 13, 14, and 15, 1991 in Idaho Falls, Pocatello, Twin Falls, Boise, and Moscow respectively. At the meetings in Idaho Falls and Pocatello, representatives from DOE, EPA and IDHW discussed the project, answered questions, and received public comments. At the meetings in Twin Falls, Boise, and Moscow, DOE and IDHW were represented. Verbatim transcripts were prepared by a court reporter of each public meeting. Each was recorded on audio tape and the Twin Falls and Boise meetings were videotaped as well. Written comment forms were distributed at each of the meetings.

Summary of Comments Received During Public Comment Period

Comments and questions raised during the Warm Waste Pond interim action public comment period on the Proposed Plan are summarized briefly below. The comment period was held from July 29 to August 28, 1991. Many questions were answered at the public meeting as reflected in the transcripts in Appendix A. Comments and questions on a variety of subjects not specific to the Warm Waste Pond were recorded. Those subjects included nuclear arms production, dose reconstruction, diversion of cleanup funds, references to unrelated documents, etc., and are not responded to in this Responsiveness Summary. Additional information on these unrelated subjects can be obtained from the INEL Public Affairs Office in Idaho Falls or at the local INEL offices in Pocatello, Twin Falls, and Boise. The questions on the Warm Waste Pond not addressed at the meetings, and comments, are categorized below.

Characterization Data

Many questions at the public meetings concerned the characterization data, including monitoring, geological and hydrogeological information used as the basis for the proposed action. Unless specifically addressed below, that information is available in the administrative record report.

1. Two commentors expressed concern that the analyses for radionuclides was incomplete.

   Response: A standard set of radiological analyses were conducted on the Pond sediments, including I-129, Pu-238, Pu-239, and Pu-240. The I-129 analysis was not discussed in the Proposed Plan, but averages approximately 0.3 pCi/gm, and does not pose an unacceptable risk.

2. One commentor felt that the Warm Waste Pond as an operable unit allowed for inadequate characterization or confused the public concerning the number of sites at TRA.

   There are thirteen operable units at TRA encompassing 49 sites. All of the operable units will be, or are being, evaluated as described in the FFA/CO, which also includes a description of the breakout of the Warm Waste Pond as an operable unit. Other operable units include the MTR canal, the Retention Basin and associated piping, and the perched water.

Operations at Test Reactor Area

3. Many commentors felt the current use of the Pond is inappropriate, if not illegal, and were concerned with the effects of leaching contaminants, perched water, and fugitive dust.

   Response: The use of the Warm Waste Pond has always met the laws and regulations in effect at the time, including its use at the present time. Most of the contaminants in the Pond sediments are the result of past disposal practices, not current discharges. The volume and levels of contaminants in the wastewater have decreased over 90 percent in the last 10-15 years. The wastewater discharged to the Pond, as well as the sediments in the Pond, are not hazardous as defined by RCRA. The contaminants present in the sediments are largely insoluble and are not easily leached. Information from investigations show that the more soluble contaminants have migrated to layers below the ponds into the perched water and the aquifer. The water discharged to the Pond contributes to the perched water system. The impact of the perched water system on the Snake River Plain Aquifer, is currently being evaluated in an RI/FS. The Warm Waste Pond is scheduled to be replaced by a lined evaporation pond in 1992, and therefore for all of the alternatives the potential leaching of contaminants would be reduced. An acrylic-copolymer dust suppressant has been sprayed on the Pond to reduce fugitive dust and will be reapplied as necessary.

4. Three commentors expressed concern that the lined evaporation pond which will replace the Warm Waste Pond could leak or asked about the cost and/or schedule for the new pond.

   Response: The proposed action addresses cleanup of the sediments which may pose a threat to workers/visitors due to the radiological hazard primarily from cesium and cobalt. The elimination of future discharges to the Pond is being evaluated in the perched water RI/FS. The new lined evaporation pond is subject to operating and regulatory requirements which are beyond the scope of this document. Information on subjects like the new evaporation pond can be directed to the INEL Public Affairs Office.

Risk Assessment

Many commentors had questions or concerns regarding risk assessments.

5. Many commentors felt that the preliminary risk assessment process is flawed and the scenarios evaluated were inappropriate, in that institutional controls were adequate to prevent the calculated estimated risk.

   Response: National risk assessment guidance was used for the evaluation of risks to human health and the environment. This guidance applies to all publicly or privately owned facilities. As is often the case, there are a wide variety of opinions on the degree of risk which is acceptable and the scenarios which should be evaluated to determine that risk. Institutional controls are not included in the evaluation as they may not continue indefinitely. The preliminary risk evaluation considered several scenarios to assess the potential threat to human health and the environment.

6. Several comments concerned the interpretation of the risk assessment of the interim action.

   Response: The results of the preliminary risk evaluation for the interim action, which is in the administrative record, are summarized in Section VI of the Decision Summary of this Record of Decision. The risks associated with external exposure to radiation, and inhalation and ingestion of contaminated soil were evaluated. The risks due to ingestion of contaminated water below the Pond will be evaluated in the perched water RI/FS. The uncertainties associated with the risk evaluation process are addressed in the preliminary risk evaluation report. The target treatment level established for the pilot study, when implemented in the remedial action, will reduce all of the identified risks to within the target risk range.

Remedial Alternatives

7. Concerns were raised that not all appropriate technologies were considered, particularly vitrification.

   Response: For an interim action, it is sufficient to select a remedial technology which reduces the present potential risk and therefore, the evaluation of only one remedial alternative may be adequate. In this case, EPA guidance documents (which are in the administrative record) were consulted to determine the technologies most appropriate for the cleanup of radiologically contaminated soils. Only two technologies had been used to "cleanup" radiologically-contaminated soils, capping and land encapsulation. Capping was further evaluated; land encapsulation was not, due to the large volume of material which would have to be removed, transported, stored, and/or disposed. Technologies which had been field demonstrated with radioactive material, but have not been used to remediate radiologically-contaminated soils, are stabilization or solidification, vitrification, chemical extraction and physical separation. All of these were further considered for the Warm Waste pond except vitrification, which has only been demonstrated on much smaller-scale projects and would be much more expensive than the other alternatives evaluated. The no action alternative was also evaluated.

8. Several commentors felt capping was not "cleanup"; others felt it was the most cost effective alternative.

   Response: Capping is described in Section VII of the Decision Summary. Based upon the potential risks which must be reduced, capping is appropriate as an interim action because it reduces the risk due to external exposure and reduces the mobility of the contaminants. However, since the contaminants are left in place and therefore not "cleaned up", the potential for future problems exists. In some cases, that potential risk would be low enough such that capping would be an adequate remedy. For example, if only cobalt-60 were in the Pond sediments, with a 5.3 year half life, it would decay significantly in 100 years and would therefore not be a problem in that future use scenario. Cesium-137 has a half life of 30.2 years and would not decay quickly enough to be eliminated as a long-term future risk. Therefore, the Pond sediments would have to be addressed in another remedial action at a later date if capping is implemented in this interim action. Regardless of the alternative selected, the need for monitoring the groundwater will be evaluated in the perched water RI/FS.

9. Many commentors felt stabilization was inappropriate to the cleanup of the Warm Waste Pond or questioned whether it provided less exposure to workers during implementation.

   Response: Stabilization is described in Section VII of the Decision Summary. Stabilization immobilizes the contaminants and, when backfilled, reduces all of the identified potential risks. Two problems identified by commentors were the long-term effectiveness and interference with future remedies. Both are legitimate concerns. As pointed out in the above response, if only short-lived radionuclides were involved, the expected permanence of the stabilized mass would be adequate. With the longer-lived radionuclides, this becomes more of a concern. Of course, the stabilized mass could make future remedial efforts difficult and more expensive. Stabilizing, then removing the sediment would involve an excessive volume of material. It is for those reasons that the Agencies did not select stabilization as the preferred or contingent remedy. Whichever alternative was selected, the same degree of worker protection and radiation exposure minimization would be incorporated into the design.

Selected Remedy

10. Several questions and comments focused on the implementability and cost of separation/extraction, the treatability study, and the contingency remedy.

Response: As described in Response 7 above, capping and land encapsulation are the only remedies which have been used to remediate radiologically-contaminated soils. The Agencies preferred a remedy which removed the contaminants and thereby permanently reduce the risks associated with the Warm Waste Pond. Physical separation and chemical extraction provide that removal. While the initial capital costs of separation/extraction are higher than the other alternatives (as described in Sections VII and VIII of the Decision Summary, the long term costs are likely to be lower due to lack of maintenance costs or cost associated with another remedial action. Although the Warm Waste Pond remediation would be the first use of separation/extraction technologies in remediating a radiologically-contaminated Superfund site, the technologies are both commonly used in the mining industry. The main difference between this application and in mining are the target radionuclides. Cesium is not mined and therefore has not been evaluated for this technology. A bench-scale treatability study (in administrative record) indicates that the desirable cleanup levels can be achieved. A pilot study is required to ensure that the range of contaminants and sediment types found in the Warm Waste Pond can be successfully remediated and is included in the cost estimate. Following the Record of Decision, further treatability studies will begin and will be performed by DOE contractors. The treatability studies are described in Section IX of the Decision Summary. The material returned to the Pond and the residuals will be tested to ensure the cleanup standards are being met. If successful, the technology developed for the remediation of the Warm Waste Pond will be applicable to many sites at the INEL and across the nation. The equipment will be designed to be modular so that it can be dismantled and reused at other DOE sites. The remedial design will be included in the administrative record upon completion. The contingency remedy was omitted as described in the Explanation of Significant Differences on Page 32.

11. Many concerns were raised on the storage of the residuals created by the separation/extraction process. One commentor asked if the ICPP could process the residuals.

Response: Until the treatability studies described in Section IX of the Decision Summary are completed, the type and quantity of waste generated can only be estimated. However, it is expected that less than 200 cubic yards of low-level radioactive waste will be generated. The sediment in the Pond is not RCRA hazardous. If the metals are concentrated enough by the separation/extraction process so that they leach using the Toxicity Leaching Characteristic Procedure (TCLP) in amounts sufficient to be above the RCRA limits, the residual will be treated to reduce the leachability to acceptable levels. Therefore, no RCRA hazardous or mixed waste is likely to be generated. The State has stipulated that the residuals be stored such that they can be visually monitored until the final disposition of the waste has been determined. The final disposition of the residuals must be determined prior to or in the WAG-wide Record of Decision. Therefore, at this time the residuals will be stored in containers in a controlled manner at or near the site of the Warm Waste Pond. Final disposition of the residuals will be determined at a later date with State concurrence. If necessary, transportation of the residuals will be in compliance with all INEL and DOT requirements, which base the packaging, labelling, etc... on the type and degree of hazard posed by the shipment. The ability and cost effectiveness of the ICPP to process the product residual will be evaluated in the pilot study.

Research Applications

12. Concerns and questions arose about research in waste management and remedial technologies and their applicability to INEL.

Response: Research has always been a major part of the INEL's mission, and in recent years research in waste management and remedial technologies has expanded. Technologies which involve treatment are preferred under CERCLA, although cleanup is not delayed until new technologies are developed. Testing of a technology may be part of the remedial design or remedial action, as is the case in this Record of Decision. Although not a consideration in the selection of the remedial alternative for the Warm Waste Pond, proving the use of separation/extraction as a remedial alternative for radiologically contaminated soils will make it a more viable option for future remedial actions nationwide. Remote cleanup methods may be utilized where the hazards posed by the site make it more efficient.

Agency Involvement

13. Several commentors felt the identification of sites, prioritization of cleanups, coordination of activities, and the standards set for cleanups were unclear.

Response: Environmental restoration at the INEL and most other DOE facilities is conducted under agreements with state and federal agencies. At the INEL, this agreement was the Consent Order/Compliance Agreement (COCA) with the EPA. Following public comment, the FFA/CO will supersede the COCA, thereby giving the State of Idaho and EPA equal say in establishing environmental restoration priorities at the INEL. Coordination among DOE facilities is managed by DOE Headquarters. As new sites are identified, through process knowledge, employee interviews, or field detection, they are prioritized by the Agencies. All cleanups must meet federal and state requirements, which require sites which present an unacceptable risk to be evaluated using the nine CERCLA criteria and cleaned up. Other CERCLA requirements include a timetable for remedial activities following a ROD and community relations activities.

14. Several commentors felt that DOE and/or EG&G should not be responsible for cleaning up sites which it had contaminated.

Response: As a result of inclusion on the National Priorities List (NPL), the INEL must follow the requirements of CERCLA, the Superfund law. CERCLA has clear requirements for characterization, risk assessment, remedial technology selection, and community involvement. DOE, with the State of Idaho and EPA oversight, will proceed with characterization and cleanup of the INEL following the requirements of CERCLA.

Community Relations

15. Several commentors felt that the meetings were poorly attended because of inadequate media coverage or notice, the Proposed Plan was inadequate, or that comments may not impact the decision process anyway.

Response: Community relations activities, including newspaper, radio, and television advertisements and stories are described in Section III of the Decision Summary and Section 2 of this Responsiveness Summary. Since no extension of the public comment period was requested, it appears adequate time was allowed for comments. Local television and radio stations were notified of each meeting in advance. Written comment forms were available at each public meeting and written comments were encouraged at the meetings, in the Proposed Plan, and in the cover letter. All comments, verbal or written, and all unanswered questions pertaining to the Warm Waste Pond are addressed in this Responsiveness Summary. The transcripts of each meeting and copies of each written comment are in the Information Repositories. Comments are indexed to the number of the response which addresses them in the Responsiveness Summary. An example of the positive impact of public comment in the decision process for this Record of Decision was the incorporation of the suggestion that the ICPP be evaluated for treatment of the extracted contaminants. The Proposed Plan is not meant to be an all-encompassing document, but rather a concise summary of the preferred alternative and the information leading to its recommendation.

NEPA

16. Several commentors questioned whether NEPA requirements were being met by the interim action.

Response: This Record of Decision addresses CERCLA requirements. The requirements of NEPA for this action are being evaluated separately.